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Science and Religion at a Crossroads: An Educational Perspective

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Abstract

This article's thesis is that religion and science are ultimately about the same thing, that they affect one another, and that people in the two fields therefore need to communicate. The authors begin by discussing the importance of ethical transformations to a life of love and character, arguing that the development of a technological society does not free us from ethical demands. They then move to advocating dialogue about the shared truths of science and religion. Wanting both, and positing that the former is a foundation for the latter, the authors state that Einstein's famous logion cannot be ignored: "The situation may be expressed by an image: Science without religion is lame, religion without science is blind" (Einstein 1954, 55).

LOGION

Science and Religion at a Crossroads: An Educational Perspective

The rapid ascent to modern civilization within the last 200 years has been possible because of the exponential growth of knowledge. The scientific and technological advances have been astounding. For example, in the winter of 1901, camped out on Labrador's frozen shore, the young Italian inventor Guglielmo Marconi detected a weak radio signal, the letter "s" in Morse code. The little message traveled 2,000 miles across the Atlantic Ocean from a station in Cornwall, England (Herbert 1988).

Until the 19th century, it was widely believed that trains could not travel faster than about 50 miles per hour because of the immense tornado-like winds that would be created along their paths. Some British scientists predicted air would be evacuated from railway cars at speeds in excess of 100 miles per hour, and all the passengers would be asphyxiated. By contrast, as we step into the 21st century, a recent scientific paper noted the feasibility of flying to the asteroid belt, latching onto an asteroid, and "bringing" it back to earth. The metals in the asteroid would be refined in orbit above the earth and flown down to the earth's surface. An average size asteroid is valued at two trillion U.S. dollars. High tech industries are yet to be born in space, and the economic revenues seem immense.

Our technology today can take pictures of the past (Levy 1962). Tomorrow or next week one could take a picture of today. Matter radiates infrared "heat," and each of us gives off the energy of a 100 watt bulb. Infrared cameras construct pictures from this energy. It is theoretically possible to record Abraham Lincoln's Gettysburg Address live as it was given, and now there are debates about the possibility of building a time machine.

The distance to the nearest star, Proxima Centauri, is 4.3 light years. Most stars in the night sky are 100 to 1000 light years away. A chemically propelled rocket would take 80,000 years to reach the nearest star, but faster-than-light travel changes all these time constraints. We are steadily wrestling with the nature of the significance of time in a universe where relativity theory leads us to singularities that are more real than many have yet imagined (Thorne 1994). In a letter he wrote to the family of his lifelong friend Michele Besso on March 21, 1955, Einstein stated: "The distinction between past, present, and future is only an illusion, however persistent" (Calapice 1996, 61). Einstein noted that time is not at all what it appears, that it does not merely flow in only one direction, and that the future may in some sense exist simultaneously with the past. Isaac Newton's theological notebooks reveal he believed the future already existed (Westfall, 1963). The future is open to us in ways we are just beginning to grasp.

In the popular first-generation Star Trek series, the starship Enterprise's "warp-drive engines" propelled it to speeds as high as Warp 8, or 512 times the speed of light, the speed of a warp-drive vessel being equal to the cube of the warp factor. Warp 8 could be used only briefly, in emergencies. The Enterprise's

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maximum cruising speed was Warp 6 (216 times light speed). At Warp 6, travel time to the nearest star (4.3 light-years distant) was about a week. To the crew of the Enterprise, warp-drive technology made star systems seem as close together as Pacific islands in the days of the clipper ships.

Numerous physical processes occur in nature that are known to move faster than light. Inside a plasma, for example, light itself (radio waves constructed as low-frequency light) travels faster than light. Ironically, physicists discovered this property of waves in an ionized gas in the early part of this century, at the same time (1905) that Albert Einstein was asserting that "velocities exceeding that of light have no possibility of existence" (Herbert 1988, 63). But faster-than-light technology has more consequences than just reducing travel time to the stars. With faster than light travel, Einstein's special theory of relativity shows how to build a time machine. Theoretically, one can drop in-or-out of time periods anywhere in the past or the future.

Today, there are basically two kinds of time machines that are discussed in the scientific literature. One sends people and equipment back into time, and the other sends only information back into the past. The most simple time machine is one that sends information back into time. The results from a recent test in space to confirm if this could be done were inconclusive. If tests prove successful, then a simple time machine to send messages back to past history can be built out of ordinary radio transmitters and a few big black billboards (Herbert 1988, 168-169).

Stephen Hawking, a leading scientist on the physics of time, holds that the hypothetical and the theoretically real are to be distinguished from one another. He writes, "Perhaps fortunately for our survival (and that of our mothers), it seems that the laws of physics do not allow such time travel. There seems to be a Chronology Protection Agency that makes the world safe for historians by preventing travel into the past" (Hawking 1993, 154). The laws of physics are time-symmetric, and Einstein's theory of relativity does not prohibit time travel. However, many physicists think that Einstein's theory should be modified to exclude time travel.

There are more such fascinating prospects for the future; however, the development of a technological society does not free us from ethical and moral demands. Science must ask the 'why' questions as well as the 'how' questions. It cannot be divorced from issues that take humanity quite beyond science itself. This is important to understand today. Penetrating into the nature of time cannot merely be a technological achievement, but such investigations must be done with a view towards understanding the Law of the Life of God with us. Torrance (1981, 71-72) writes, "This is not to imply that natural science can answer the question which in some form it is bound to raise, but if it recognizes that the universe through its intelligibility points beyond itself to an ultimate self-sufficient Ground,..., it must surely go beyond the impersonal conception of Einstein, in entertaining the conception of a personal God as the creative Source of all the meaning and rational order disclosed through its investigations of nature." Thus, John Archibald Wheeler has called for 'Meaning Physics', when the 'why' and 'how' questions are resolved together in our understanding of the freedom and order of the development of the physics of the world (Wheeler and Zurek 1983).

Relativity theory is not relativism. It is in fact the best and right way to grasp reality in all its depths, and it will not be overturned by future developments. Future developments will justify it in the same sense that it justifies the classical world as a limited case of a broader reality. Relativity has provided a theory the nature of which has explained not only contemporary empirical data but also what 'ought' to be in the future. For example, Kip Thorne's Laser Interferometer Gravitational-Wave Observatory (LIGO) project is seeking to evidence the gravitational waves that pass by the earth from black holes (Thorne 1994). Thorne's research provides an objective relationality with the real objectivity the universe displays of itself.

The next century will see gigantic skyscrapers rising into the skies of earth from New York to Beijing. When the Petronas Towers in Kuala Lumpur, Malaysia, was completed in 1996, the 1,483 feet structure became the tallest building in the world, edging past Chicago's Sears Tower. The twin-towered skyscraper resembles a pair of cylinders capped with minarets (Pacelle 1996). Blueprints for the Tokyo-Ecopolis City

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1000 show a two-thirds-of-a-mile-tall building designed to house 75,000 people. Other proposed supertowers include the Ohbayashi Corporation's 500-story building, five times taller than the World Trade Center; Taisei's Mt. Fuji-shaped X-Seed that is to tower two-and-a-half miles and house 700,000 people; and the Shimizu Corporation's TRY 2004, a mile-and-a-half high glass complex that will house a million people. Some predictions about our personal futures include: Alteration of the processes of aging by 2005; the human brain linked with computers to enlarge our intellect by 2020; total mastery of human genetics and heredity, 2030; suspended animation, 2040; and complete control of the aging process, 2050.

The Present Mileau Of Challenges

The present, past, and futuristic prospects for science and technology are truly fascinating; however, as we consider traveling to the stars, mastering human genetics, or achieving man-made immortality, we must also consider the political, social, economic, religious, and psychological problems of our age: (a) can we overcome racial divisions and religious extremism, (b) can we deal with world debt and the population explosion, (c) can we create healthy societies free from pain and suffering, (d) is it possible to have a world at peace, (e) can nature's balance be restored (pollution and upset weather), (f) can we live by principles of ethics and morality, and (g) is the pressure to advance technology out of control (Johnson 1994).

In a world of poverty and violence, our civilization finds itself with an abundance of subtle and complex problems. Perhaps we will use our technology unwisely. NASA's launch of the Cassini space probe carried 72 pounds of plutonium 238, the most deadly substance in existence. The Saturn probe swung around Venus in order to gain velocity for the long journey. Its path brought it within 312 miles of Earth. There was little room for error. Perhaps we will destroy ourselves. The next world war would be fought with weapons of mass destruction. Today it seems there are at least 50,000 nuclear weapons, from atomic artillery shells to multi-warhead ballistic missiles. Each can destroy a whole city. The whole world could be obliterated in a few hours.

Perhaps the common enemies within us will be too strong to recognize and overcome, and the fear of our powerlessness to change ourselves will paralyze us. Perhaps the world will be reduced to medieval conditions. In less than a century, from the Civil War to the hydrogen bomb, our most fearful weapon has become a billion times more powerful. In all this, the ultimate question is whether we will manage crises or whether they will manage us (Sagan 1997; Strauss and Howe 1997). Will we become at home in the universe or destroy ourselves within a nightmare (Wheeler 1996).

Perhaps we should consider that the world's problems are often obscured, confounded, or created by the culture itself. MIT's Edgar Schein has posited that culture operates at three levels (Schein 1985). At the most visible level are artifacts, the constructed physical and social environment. Elements of culture at this level include specific organizational technologies, artistic productions (including myths, symbols, stories, and legends), and overt behaviors. At the intermediate level, culture is manifested as values. Events are assigned meaning in accordance with what ought to be. Those values that are consistently useful over time are transformed into assumptions, the deepest level of culture. Questions and answers are both often oversimplified, superficial dichotomies are often created, and answers to questions may depend on unspoken assumptions.

For example, how does a country view its relationship with nature? Our forests, topsoil, food, and freshwater resources are being used up at a rapid rate. To what extent is it perceived that the natural environment can be controlled? What is the nature of reality and truth? How do nations take action, how do they determine what is relevant information, and when is there enough information to determine what action to take? What is the intrinsic nature of human nature? Are people inherently lazy needing external control, or are they self-motivated needing only direction? What is the nature of human activity as nations define behaviors that are appropriate and acceptable? What is the nature of human relationships, and how should we relate to each other (Schein 1985, 86). These questions ripple through mainstream political, economic, social, and religious issues in every nation.

The authors posit that the solutions to these global issues, obscured and confounded as they often are in culture, are the essence of the coming ethical transformation. However, these problems will not be solved the way mankind has historically tried to solve problems. Six thousand years of recorded history shows these challenges have not been solved by traditional avenues. Furthermore, they are not necessarily problems that modern science can address since they are problems of the heart and mind, of attitude and a way of life. They entail an approach to life and an understanding of the reason for living, its purpose, and its meaning. Einstein noted the thinking that led us into our problems would not be the thinking that would lead us out of them. He asserted that moral questions were of utmost importance for human existence and that in order for humanity to continue, it must create a moral order. In a contemporary setting, John Archibald Wheeler's 'Meaning Physics' has stated the 'how' and the 'why' are implicitly one question (Wheeler and Zurek 1983). He would hope the human race will learn what it is to be at home in the world.

The Oneness Of Religion

The oneness of religion asserts that individuals must seek education and knowledge that is greater than themselves. Otherwise, people can become or be no greater than their own minds. But through the knowledge of God, individuals can become "greater than themselves." One area emerges from a synthesis of the global issues facing mankind, and all nations and peoples must consider this area as they ponder the possibility of an ethical transformation. The area is human relationships. Most human behavior occurs in the causally potent context of relationships. This shouldn't be unexpected. Physicists long ago recognized that the properties of isolated material particles are, as Bohr observed, "definable and observable only through their interaction with other systems" (Bohr 1934, 37). In quantum theory, one always deals with interconnections. The posture of the social and behavioral sciences to study the interconnections between individuals is not without precedent (Berscheid 1999). Our greatest joys and our biggest problems involve human relationships, and successful human relationships involve love and character. How may we learn of these at the heart of what the world is as it comes to us from the hand of God?

Love is defined as outgoing concern for others. As uncommon as this is in today's world, individuals with outgoing concern make personal sacrifices to help others. How many of us could dislike those who put themselves at risk of pain and discomfort in order to help us? We would desire to respond to them in kind. If we would practice this way of life, individuals would be willing to respond to and help each other instead of continually engaging one another in hostility. However, one should note that human empathy implemented is not necessarily divine love.

Today, many believe in what is called the Iron Rule: "Do unto others before they can do unto you," and that has become the principle of hostile societies. Yet the Golden Rule and universal religion assert: "Do unto others as you want them to do to you." Ascertain how you would like to be treated in situations, then treat others accordingly. This approach would build a culture of agreement, compromise, and cooperation instead of promoting hostility. Thus, natural laws of the universe rightly understood could open the door to universal peace and understanding.

The next principle is character. It is basically defined as adherence to a code of ethics and morality. It is knowing what is right and doing it, even if it is not popular. However, character also means that one is honest and trustworthy, that one can be counted on, and that one is dependable. When individuals make promises, they will do their best to accomplish and fulfill those promises. When others know that one is a person of character and integrity, they will not doubt the person's intentions or plan preemptive actions.

Personal character is ultimately a private spiritual endeavor that radiates outward to others. We can individually modulate change in the world by changing our own lives, if necessary, to build character and express outgoing concern toward others. If we are practicing love and character in the way we live, in the way we work, and in the way we perform our jobs, we will be taking a giant step toward solving world problems and resolving humanity's search for meaning (Johnson 1994). In his People of the Lie, Scott

Peck (1985) brilliantly probed the essence of evil. Relating unforgettably vivid examples of alien and inhuman evil encountered in his psychiatric practice, Peck offered hope through confrontation and love. University of Chicago economist Gary Becker recently received the Nobel Prize for his extension of microeconomic analysis to a wide range of personal relationship behaviors (Royal Swedish Academy of Sciences 1992). Perhaps it was inevitable that development of the sciences would lead to a collaborative and direct confrontation of the core mysteries of human relationships.

Some have said that wanting to achieve success is selfish and wrong. The authors posit that people should be successful so they can lift, inspire, encourage, and help others. Success is true success when one reaches a level of competence to help others be successful and happy. Real success is encouraging and motivating others to achieve their fullest potential and giving of ourselves in such a way that others can succeed. It is not success when we have achieved what we want or when we have achieved our own personal comfort, peace, or safety. We are successful when we have reached a level of competence and dependability, love, and character that enables us to serve, help, give, and share. We are successful when we are living by ethical principles, not by relativistic, situational ethics wherein we are battered by personal and social contradictions or by tensions.

According to Einstein, there is no absolute time and space. Einstein expressed sorrow that his relativistic principles were applied to ethics, and that such indirectly changed absolute morals into relative morality. His relativity belonged to a scientific culture committed to objective truth, truth that was what it was even outside mankind's epistemology. For that reason, Einstein was the enemy of relativism and merely partial descriptions from particular perspectives about reality.

Science and Religion

The breakdown of clearly identified spirituality began with the modern era, in the 18th century, but it is more extreme at the end of the 20th century when we've seen the elimination of God from the world and the secularization of society promoting a superficial, materialistic, self-centered, and self-indulgent lifestyle. Consequently, humanity has been set adrift in a cosmos without purpose or end. Modern science and technology have given us material abundance, instant communication, and knowledge that illuminates seemingly limitless possibilities. The human life expectancy was about 20 to 30 years in the Late Roman and Medieval Times. It didn't rise to 40 years until around the year 1870. It reached 50 in 1915, 60 in 1930, 70 in 1935, and today it is approaching 80 (Sagan 1995). However, science and technology have not given us meaning to life or personal beliefs, abiding transcendental goals, individual commitment, faith, or spiritual principles. Humanity's sense of personal disillusionment, spiritual emptiness, physical exhaustion, emotional frustration, social alienation, and psychological meaninglessness cannot be overcome by science and technology, economic, or political systems, but through spirituality that reaches higher than us and embraces our present purpose and ultimate destiny.

Christianity tells us about the grace of God and the lengths God went through to enter into the creation, to suffer and pay the ultimate price, and to give salvation through no act of our own. Religion teaches us about repentance. This includes primarily the recognition of our need for God, our surrender, the needed change of mind, and the responsibility for our own actions.

In a post-World War II meeting with President Harry S. Truman, J. Robert Oppenheimer, the scientific director of the Manhattan Project, mournfully commented that scientists had "bloody hands." Afterwards, President Truman instructed his aids that he never wished to see Oppenheimer again. However, science and scientists have a profound responsibility for the misuse of their findings, and the more powerful the products, the greater the responsibility (Sagan 1995).

Taken as truisms, modern science has indeed appeared bound by Cartesian reductionism, Adam Smith's economics based on 'self-interest' and the 'unseen hand,' Charles Darwin's evolution springing from 'survival of the fittest,' Sigmund Freud's happiness dependent on the 'ego,' and Isaac Newton's materialism (Slattery 1995, 613). A much deeper transition is required and very much indicated by modern

developments in our scientific culture.

Some 800 years ago, St. Malachy, often called the second founder after Patrick of the Roman Catholic Church in Ireland, prophesied that from his time there would be 112 more popes. To each he affixed a descriptive phrase, and throughout history they have borne remarkable resemblance to certain characteristics of the Pope in question. About his 112th and last Pope, Malachy had this to say: "In the extreme persecution of the holy church will reign Peter II, a Roman, who will tend his flock in much tribulation. After that, the City of Seven Hills will be destroyed and a terrible judgment will come upon its people. Finally, a gigantic curtain will fall from the skies upon the people" (Adams and Volland 1981, E14). The present pope, John Paul II, is number 110. Interestingly, Malachy gave the name (Peter II) and number (112) of his final and last pope.

Much of Christianity is also aware of the futuristic implications of the Fatima (Portugal) vision of May 13, 1917, in which three Portuguese peasant children stated the Virgin Mary appeared to them. The role of religious prophecy and the expectations and beliefs of those who embrace such affects a large and growing number of Americans. Many in organized religion also describe personal religious experiences in which they contend angelic beings have appeared to them. Repeated surveys show that 10 to 25 percent of the population have experienced, at least once in their lifetimes, a vivid hallucination in which they heard a voice or saw a form when there was no one there (Sagan 1995). More rarely, people sense a haunting aroma, hear music, or receive a revelation independent of the five senses. In some cases, these become transforming personal events or profound religious experiences. Martin Luther reported seeing the devil outside his home only a few days before his death (Erikson 1962, 59). In Christopher Columbus' early life, he stated he had a vision in which a spirit appeared to him to say he would be remembered in history as a famous explorer. This encounter changed the direction of his life, and Columbus traveled throughout Europe seeking funding for his explorations.

Powerful movements worldwide are speaking to people's emotional and spiritual needs. In some countries, nearly everyone believes in astrology and precognition. According to the polls, at least 25 percent of all Americans believe in astrology (Sagan 1995). Astrology is rife in India, and geomancy is widespread in China. Psychic surgery flourishes in the Philippines. Ghosts are a national obsession in Britain, and about 10 percent of Americans report having seen one or more ghosts. Witches are burned alive in Africa. In many east African cultures, deaths are often attributed to the ill will of living enemies or wrathful ancestors who are said to "poison" or "bewitch" their victims by occult means (Smith, 1998). Peace keepers in Haiti rescued a woman accused of flying from rooftop to rooftop. Russia is now awash in UFOs, poltergeists, magic waters, and superstition. The intelligence agencies of governments worldwide have looked seriously at psychic technology. Leaders of Western democracies regularly consult astrologers and mystics before making decisions of state. Nancy and Ronald Reagan relied on astrology in their private and public matters (Sagan 1995).

Most of the million words in Isaac Newton's own handwriting, that Newton packed in 1696 when he retired as provost at Cambridge, were not about mathematics or astronomy, but theology. Newton's theological writings reveal that he believed the future could be known in advance. He believed that the essence of the Bible was the prophecy of human history (Westfall 1995, 125). Since the laws of physics are time-symmetric, they "run" just as well backwards as forward in time. The scriptures pick up meanings of time that are not necessarily obvious in translation. In the original Hebrew text of the Old Testament, for example, the future is always written in the past tense, and the past is always written in the future tense (Gasque and LaSor 1978, 260-277). No one knows why this is the case, but we may be moving against the stream of time. In physics, thousands of experiments have shown that light is outside of time. In the world of light, existing outside of time and space, the past, present, and future are blended into one eternal, ever-present, unending now. Biblical time-fulfilling prophecies could predict the future and foretell events that happened thousands of years after the Bible was written. Dwelling in light, God would not be confined by time or space. The Creator could see the whole universe from beginning to end. Although the Creator may know the future, we are personally responsible for our choices and the actions that result therefrom. Otherwise, we would be mere robots (Schroeder 1997).

Though many discredit miracles, the laws of quantum mechanics, which state that we can never know for certain what individual atoms or subatomic particles will do, allow a mechanism by which God can intervene in our universe without violating the laws of physics and free will. Similarly, chaos theory, which describes phenomena whose exact outcomes can never be predicted (such as weather patterns), may provide a mechanism for God to choose which potential realities become actual realities. Referencing the material sciences, therefore, and positing that mankind has free will, many view Biblical prophecy as a warning, not an absolute prediction. What we do individually and as a society determines the outcome of future events. Presently, there is an emergence of fundamentalist movements all over the globe.

Many people believe that we are living in the end-times of Biblical prophecy. For example, numerous groups understand Biblical prophecy to mean that the Middle East will be the center of end-time political and religious controversy (Dan. 11) including terrible conflict in the city of Jerusalem (Zech. 14). They believe there will be a Mid-East war in which half the city will be taken and the nation of Israel will suffer a significant military defeat. Various groups believe that Jerusalem, the center of the Western world's three major religions, will eventually be declared an international city for religious worship. Many factors of uncertainty seem to be at play at this time. Having worked with the Royal Family of Jordan in educational projects for the past several years (Johnson, Johnson, and Good 1995) the authors can attest that Jordan's late King Hussein wrote Israel's Netanyahu expressing regret that Natanyahu was not working with him to fulfill God's will for the final reconciliation of all the descendants of the children of Abraham.

Others believe that the "star wormwood" mentioned in Revelation 8 is an eschatological reference to an extraterrestrial starlike object striking the earth. It is estimated there are at least 1700 asteroids and comets whose orbits intersect the earth's orbit. Since a collision occurs perhaps once every 300,000 years, the odds of a collision are remote. However, no one knows when an object last struck the earth or when the next one will strike.

Sixty-five million years ago at the close of the Cretaceous period, an asteroid larger than Mount Everest collided in what is now the Gulf of Mexico, exploding with a force 50,000 times more powerful than the world's entire nuclear arsenal, and killing all the dinosaurs. The seismic wave was felt worldwide, and there was extensive volcanic activity. All of North America was engulfed in a firestorm that apparently destroyed all life on the continent. The dust, ash, and debris sent into the atmosphere blotted out sunlight to earth and caused worldwide extinctions. All animals larger than five kilograms died.

There are billions of asteroids and comets in our solar system. The planet Jupiter filters out most of the comets that come from the Kuiper belt, but it has little effect on the billions of comets that come from the Oort cloud, far beyond Pluto. The closest near-miss of earth occurred on May 19, 1996, when an asteroid known as 1996 JA-1 missed the earth by 280,000 miles. When Swift-Tuttle sounded a public alarm and the 1994 Shoemaker-Levy bombardment of Jupiter demonstrated the potential danger, scientists began to plan the defense of earth. Edward Teller, still vigorous and intellectually powerful in his later years, mounted a campaign with his counterparts in the former Soviet nuclear weapons establishment. The intent was to develop and explode new generations of high-yield thermonuclear weapons in space to destroy or deflect asteroids that might be on collision trajectories with earth. However, on October 14, 1997, President Bill Clinton used his line-item veto to cancel the project. Such is the present status of the project.

Other groups believe that the ancient writings of Isaiah (Isa. 9, 29, 30, 41, 47) provide extraordinarily accurate predictions and visions of an atomic holocaust. Jonathan Schell's classic account of the 1945 bombing of Hiroshima (Schell 1982) sounds strikingly similar to Isaiah's 2500-year-old prophecies. Could Armageddon be nuclear war (Rev. 16. 14,16)?

Nations exist with policies utterly dependent upon their belief in an imminent apocalypse of one sort or another. These fundamentalist movements cannot be overlooked and ignored. They are emerging powers on the world scene that can potentially destabilize governments worldwide. Fanatical nationalism and

religious fundamentalism are alternatives to the desperate search for meaning and belonging ending in the total subjection of self. How then may we discern the nature of time and the signs of our times today?

Religion has had its many faults and failings, not least of which has been the inhumane ferocity of religious wars and the unspeakable atrocities against "infidels and heathens." In the 16th century, William Tyndale translated the New Testament into English. But when he tried to publish his translation, he was pursued all over Europe. Eventually he was captured, garroted, and burned at the stake. His copies of the New Testament, which a century later became the basis for the King James translation, were then hunted down house-by-house by armed posses.

Referring to the scientific ideas of Copernicus, Luther commented, "This fool wishes to reverse the entire science of astronomy" (Merken 1980, 54). Luther accepted the Ptolemaic model, developed by Claudius Ptolemy of Alexandria (c. 150 A.D.), believing in an immobile earth at the center of a finite universe. The sun, moon, and planets were supposedly attached to the surfaces of 80 or so giant crystal spheres, and the angels labored day-and-night rotating the heavenly spheres.

For 1400 years, Ptolemy's model of the universe reigned supreme. The system was in harmony with Aristotelian physics, and together the two systems offered a coherent scientific world view that was reconciled with the major religious systems of Judaism, Christianity, and Islam. By the 16th century, astronomy was so flawed by imprecision that Copernicus (1473-1543) had come to believe that the Ptolemaic system could not be a correct reflection of nature. Copernicus' solution to the problems involved a fundamental restructuring of astronomy. The Copernican system was set forth in his work, On the Revolutions of the Celestial Spheres, published in 1543. Copernicus received a copy on his deathbed. Copernicus replaced the notion of an earth at rest with one in motion. The earth was described as having three motions: A daily rotation on its axis, an annual revolution in its orbit around the sun, and a "wobbly" motion to account for the precession of the equinoxes. Copernican ideas cracked through the intellectual and theological structure of the day and eventually caused an upheaval of revolutionary proportions in the way humanity would learn to think about our world and its God (Penrose 1989).

In a similar sense, how should religion regard claims of encounters with extraterrestrials? Present scientific studies estimate that intelligent life might be, on the average, as close as 15 light years from our sun (Kaku 1994). The Voyager 1 and 2 spacecraft carry a message to possible beings of other worlds. The Voyager records include greetings in 60 human languages and one whale language, an evolutionary audio essay, 116 pictures of life on earth, and 90 minutes of music from a diversity of the world's cultures. The engineers projected a one-billion-year shelf life for the golden phonograph records. The Voyager spacecraft, with their revelations of a tiny world, are beyond the outermost planets making for the open sea of interstellar space (Sagan 1997).

How would an encounter with extraterrestrials alter our understanding of our place in the universe? What benefit or detriments might an encounter bring? Arthur C. Clarke noted that any sufficiently advanced technology would be indistinguishable from magic (Clarke 1984). If we are not alone in the cosmos, how should we cope? Are self-transformation and salvation specific to the earth or common to the cosmos?

Einstein was raised in a reverent Jewish family, but as a young man he questioned the authenticity of the Bible read in the pietistic traditions. However, he never gave up a concept of God as the source of all the rationality and intelligibility in the world, and he never accepted that the universe was governed by chance. His sayings about the Holy One are famous today, and he exposed our scientific culture, by which he has been given legendary status, to an epistemic poise under the wondrously compelling reality of a physical universe whose explanation must be rooted in the grandeur of reason incarnate in existence which could not be grasped except in humble awe of the Ancient One (Paul 1982).

Australian physicist Paul Davies noted that science does deal with religious matters. In topics such as the nature of time, the origin of matter and life, or causality and determinism, the very conceptual framework in which religious questions are posed can be altered by scientific advances. Some of the major theological

issues of several centuries ago (such as the location of heaven and hell) have been rendered meaningless by modern cosmology and our improved understanding of the nature of space and time (Davies 1983, 218-219). "We need to deepen our theological understanding of the heavens, earth, and hell, where the Biblical world and modern cosmology are put into real relations with one another and not mythical or conventional agreements" (Torrance 1969, 11).

The Dialogue Of Science And Theology

In his Summa Theologica, Thomas Aquinas reconciled 631 questions between Christian and classical sources. As we approach the 21st century, a reconciliation and expanded dialogue between scientific and religious groups is in no sense less significant than the accomplishments of Aquinas in the 13th century. The possibility of a reconciliation and expanded dialogue is hopeful and logical because many individuals in both groups have been willing to consider the views of each other. There is no necessary conflict between science and religion. On one level, they share similar roles, and each needs the other. Eight hundred years ago, the medieval philosopher Maimonides wrote that science was not only the surest path to knowing God, it was the only path, and for that reason the Bible commenced with a description of the creation. Religion is uplifted and amplified by the findings of science. The universe seems designed specifically for life. Physical constants such as the strength of gravity, the mass of the proton, and the charge of electrons appear so finely tuned that the smallest variation would prohibit life in the cosmos. This design implies intelligence, and such intelligence implies purpose to humanity's existence. From the intricacies of the earth's ecology to quantum mechancis and relativity, religion sees God as the great creator, designer, and sustainer of the vast universe.

Science is confronted and challenged by religion as religious scholars note that science has undermined religious tradition and promoted a move toward secularization by attacking the composition, authority, and divinity of the Bible. On the other hand, science has challenged religion to become more tolerant and see its negative side that tends to prevent acceptance of anything new, fostering a sense of tension. Science notes that religions are nearly always exclusivistic and triumphalistic. Religious scholars argue, however, that once we admit there is some intelligence beyond our own, everything else must be reexamined.

The Institute on Religion in an Age of Science (IRAS) is an independent society of scientists, philosophers, religious scholars, theologians, and others who want to understand the role of religion in our dynamic scientific world. Each year, IRAS holds a week-long conference on Star Island off the coast of Portsmouth, New Hampshire and organizes events at the annual meetings of the American Association for the Advancement of Science and the American Academy of Religion. The authors envision the establishment of several tax-exempt foundations to further these bold efforts.

Across the academic communities of the world, there is a new openness to the interaction of God with the development of world history, and growing numbers of people are allowing for a meta-physical explanation of the physical nature of the universe. Scientists often acknowledge a sense of the divine from looking at life on earth and at order in the universe. For example, the efficience of DNA as a carrier of data is so great that if all the information held in all the libraries of the world were programmed onto DNA, that information would fit on about one percent of the head of a pin. Yet the human brain has ten thousand times the capacity for information as has the human genome (Schroeder 1997). Six years ago, the Princeton Theological Seminary established a chair dedicated to science and theology. The products of the Princeton's Center for Theological Inquiry and the Princeton Theological Seminary together represent a major thrust in the study of the religious-scientific union. Their efforts promise to be novel and historic. In 1995, Davies won the Templeton Prize for Progress in Religion after the publication of his book The Mind of God: The Scientific Basis for a Rational World. Sir John Templeton's financial contributions to the National Institute for Healthcare Research are also noted. The Institute is promoting research on religion, devoting its time to "spiritual progress" quantifying that religion is beneficial to one's health.

The authors applaud such activities and hope this dialogue can be enhanced and expanded internationally after more than 400 years of separation between science and religion. Historically realism, the philosophy

of science, was understood as searching for the truths God had created in the universe. The 17th century German astronomer Johannes Kepler described his pursuit of science as a wish to know the mind of God. In our century, leading scientists like Einstein have used almost identical terms (Clark 1971, 19). Some of the greatest scientists of history, including Copernicus, Galileo, Kepler, Newton, and Einstein, are as renowned for their spirituality as for their scientific brilliance.

What science and religion have accomplished is truly impressive (Bartusiak 1986; Hawking 1988). Perhaps the time has come for science and religion to acknowledge each other's power and influence, join forces, and work together in mutual respect to help solve the world's problems. The possibilities seem immense since such would combine the foundation of science and technology with the world's historical and emerging spiritual powers. Alfred North Whitehead once said that "when we consider what religion is for mankind and what science is, it is no exaggeration to say that the future course of history depends upon the decision of this generation to the relations between them (Whitehead 1926, 260).

Sir John Templeton (1995) noted that the existence of the vast universe itself should challenge both science and theology to seek new areas of cooperation. Pope John Paul II has noted that science and religion can each draw the other into a wider world, a world in which each can flourish. Each has a common quest for truth. Religion can purify science from idolatry and false absolutes, and science can purify religion from error and superstition.

The concept of the creation of the universe by God, originally derived from the Hebraic tradition, became a part of Christian doctrine from the beginning. It was the divine Word or Logos by whom all things were made and without whom no created thing came into being. Although the answer to the 'who' question of the creator is given in theology, there is no 'how' explanation in the Hebraic or Christian literature. Juxtaposed to the 'who' question is the 'how' question (Jaki 1992).

According to hyperspace theory, before the Big Bang, the cosmos was a perfect ten-dimensional universe, a world where interdimensional travel was possible. However, this ten-dimensional world was unstable, and eventually it "cracked" in two, creating two separate universes: A four- and a six-dimensional universe. The universe in which we live was born in that cosmic cataclysm. The Big Bang produced energy, all of it squeezed into a volume possibly smaller than a human thumb. Within the first one hundred thousandth of a second following the Big Bang, the universe had expanded to about the size of our solar system. As our four-dimensional universe expanded explosively, our twin six-dimensional universe contracted violently, until it shrank to almost infinitesimal size. The Ramban, the great medieval commentator on Scripture, notes that at the moment after creation, all the matter in the universe must have been concentrated in a tiny speck. The fifth dimension is calculated to be smaller than the nucleus of an atom; yet paradoxically, the entire universe is contained inside the fifth dimension. The contraction of the six-dimensional universe would explain the origin of the Big Bang. The energy that drives the observed expansion of the universe is then found in the collapse of ten-dimensional space and time (Kaku 1994). Cabalistic tradition states that most existence is hidden, folded into 26 basic and 10 general dimensions. String theory makes a similar estimate. The impact of hidden dimensions on physical reality is at best extremely complex. These examples are illustrative of Templeton's assertion that the existence of the universe should challenge both science and theology to seek areas of cooperation. With the possible genesis of a unified field theory in the next decade or so, the next question will be 'why' the universe was created. Purpose is a point where the wisdom of empirical science ends and the quest for religious faith begins. With Heisenberg's uncertainty principle, the scientific community conceded there was indeed a limit to scientific knowledge. This seems all the more significant when one considers that the human brain has the capacity to store the information contained in a 50 million volume encyclopedia.

Galileo, the foremost scientist of the 16th century, invented the barometer. Using water instead of mercury in his barometer, the tube went up through the roof of his house. And in order to be able to tell how high the water was on a given day, Galileo floated a wooden figure of a red devil on the water. Galileo's neighbors began to notice that the red devil came up out of the house on bright sunny days and went back inside on rainy days. But what really upset his neighbors was that the red devil kept behaving this way even when nobody was home. They attributed this to sinister associations with the devil and broke into

Galileo's home to destroy the barometer.

Galileo's genius extended in many other directions. Giving credence to the Copernican view of a moving earth, Galileo was the first to provide conclusive refutation of the Aristotelian ideas about motion through observation and experimentation (McKenna 1997, Chapter Three). Galileo was arrested in 1633 for popularizing Copernican theory and for his other contributions to scientific thought. In October 1992, John Paul II delivered a speech vindicating Galileo.

Perhaps no where today is the cooperation of science and religion more noted than in medicine. There is a growing body of research on the role religion plays in health. Studies now show that elderly Americans with strong religious faith have lower blood pressure, less depression, and stronger immune systems. New evidence that religion is good for one's health is so compelling that it is leading to a whole new frontier in medical research (Wehmeyer 1997). Duke's Harold Koenig is a pioneer in the scientific study of religion's healing potential. His research team, studying thousands of Americans since 1984, has compiled powerful evidence that religious faith not only promotes overall good health, but it also aids in the recovery from serious illness. Researchers in Israel studied 3900 people over a 16-year period. They found that the religious had a 40 percent lower death rate from cardiovascular disease and cancer than their secular peers. A Yale study of 2812 elderly people found that those who never or rarely attended church had nearly twice the stroke rate of weekly churchgoers (McConnell 1998). Diener, Suh, Lucas and Smith (1999) note that a number of large studies, often based on national samples, show that subjective well-being correlates significantly with religious certainty, strength of one's relationship with the divine, prayer experiences, and devotional and participatory aspects of religiosity, even after controlling for demographic variables such as age, income, and marital status. These, and similar findings (Thomas 1997), are changing the way medicine is practiced. All U.S. residency programs for new psychiatrists, for example, are now required to address religious and spiritual issues in their formal training.

In his work at the Harvard Medical School and the Mind/Body Medical Institute, Herbert Benson, M.D., is the course director for conferences and seminars that provide training in mind/body interventions. Using the biopsychosocial-spiritual model of health as a framework, the core curriculum for his conferences provides participants with an understanding of the following: (a) the relationship between spirituality and healing from the perspective of the world's major religions, (b) the scientific evidence for the effects of spirituality on healing, (c) the physiologic and neurologic effects of healing resulting from spirituality, and (d) the relationship between healing, spirituality, and mind/body effects. The conferences continue to explore the relationship between spirituality and healing in medicine and to give perspectives from world religions. Research has established that spirituality is associated with fewer medical symptoms in the ill (Benson 1975). Dave and Susan Larson's research on the relationship between religion and health (Larson and Larson 1994) complements Benson's work. They have found that those who are religious tend to be healthier and live longer. Since 60 percent of the population would like to discuss spiritual issues with their doctors and 40 percent would like their doctors to pray for them, the Larsons would like to see doctors include faith in the initial patient history.

Another emerging area of overlap for science and religious themes is witnessed in the area of philosophical counseling. The German philosopher Gerd Achenbach is thought to be the first to revive the long-forsaken profession of philosophical counseling when in 1981 he founded the Samaritans, a suicide-prevention organization. The aim was helping individuals arrive at satisfactory self-explanation and clarification. The focus today is for individuals to examine their moral, political, metaphysical, and epistemological ideas (Phillips 1997). Many of these ideas have been historically addressed in a religious context.

In a related area, researchers are seriously addressing issues of religion and evolution, looking at the teachings of religion and the findings of science (Denton 1986; Johnson 1995; Thaxton, Bradley and Olsen 1984). An open, scholarly reexamination of the evidence for evolution, or lack thereof, is being conducted in a spirit of reconciliation (Meyer 1996). Secular evolutionists claim development was by random mutations while theologians see a channeling in the flow of life that implies a teleology. Sponges, rotifers, annelids, anthropods, primitive fish, and all the other body plans represented in the 34 animal

phyla extant today appeared as a single burst in the fossil record 530 million years ago. Based on radioactive dating of rocks that bracket the Cambrian explosion, the development occurred within a period of five million years (Schroeder 1997).

Research Recommendations

For the present and future potential forms of dialogue to continue, there is a need for research to understand how religious scholars and scientists can more effectively work together. More information is needed about the attitudes of both groups and their perceptions about what role each might play in a continuing and expanded dialogue. What personal and professional characteristics of each group predict whether they view the other as playing a significant role in an expanded dialogue? What are some fears or concerns of each group? This research may help identify barriers to the groups working together. Such barriers may involve concerns that religious scholars may try to impose their belief systems on others or devalue the research underpinnings of the scientific community.

Research is needed to better understand how much religious scholars really understand about science. Do they need continuing education in science? How much knowledge do they have about available scientific resources? What scientific resources do they actually utilize? More research is needed to investigate the function of religion. Do scientists believe that some forms of religion actually contribute to society's problems? Which forms are most helpful?

Each group should consider creating positions for professional liaisons. The individuals could facilitate communication between the religious and scientific groups by fostering continuing education programs and developing educational materials which would address the surveyed needs of each group. The lack of research, training, and collaboration between the two groups is all the more unfortunate given the clear evidence of the contributions of the two groups.

Summary and Conclusion

The challenge of this article has been to focus not on the material, mechanistic aspects of religious change but on the deeper level of spiritual transformation that requires more fundamental change such as would be expressed in ethical transformations and in a reconciliation of science and religion. The former is posited to be a relational foundation for the latter. The 20th century will be remembered for several broad innovations: (a) unprecedented insights into the nature of ourselves and the universe, (b) unprecedented means to save and prolong life, and (c) the unprecedented technological capacity to annihilate ourselves. It will also be remembered as a century in which there was a breakdown of traditional symbol systems like the rituals of death and marriage and clearly identified authority such as that expressed in the historical force of spirituality. However, perhaps there is a kind of silver lining to this change because it is forcing us into a new kind of thinking.

United States' Presidents have continually challenged young Americans to service and idealism. By helping young people, families, the disadvantaged and those in need, we recognize a simple but powerful truth: We need each other. We must care for one another by embracing the spiritual principles of love, character, the purpose of human life, and how we should live and respond to one another. Historically, the humanists of the Renaissance embraced the Enlightenment view that tolerance was a virtue and upheld it to a place more important than religious fervor. Perhaps we shall see a 21st century Renaissance.

The modern scourges of Western society, such as suicide, drug abuse, and crime, are usually explained in personal, social, political, and economic terms like unemployment, poverty, child abuse, or family breakdown. Might these problems reflect a profound and growing failure of our culture to provide a sense of meaning, belonging, and purpose to life, as well as a framework of

values. A society marked by ever-increasing reductionism clearly lacks a vision of something higher than itself. However, individuals need to feel they are a part of a greater human community and a valued member of society, to be a part of something greater than themselves, and to have a sense of spiritual fulfillment (relatedness and connectedness to God, the natural world, and the cosmos). Spiritual wellness involves answering questions about the origins and destiny of humanity, learning and developing bases for moral decisions, and having a philosophy of life. Otherwise the resulting uncertainty and confusion will be reflected in cynicism, hesitancy, social passivity, and insecurity as the gears of hopelessness and low self-esteem mesh to create a kind of perpetual failure machine. Missing a broader meaning in life, the result will be pathological self-preoccupation and secularism with little more to believe in than self and materialism. In a world plagued by uncertainty or horror, people long for spirituality or religious expression to elevate and expand their being beyond their ordinary life experiences. In the argot of the day, people have a natural thirst for transcendence and built-in desires for spiritual expression.

Individually and collectively, we can stand against these currents of cultural decay and even change their course. The authors envision hope and possibility, expectation, belief, healing, and dialogue which embraces both the freedom and the order of the world. The unprecedented powers that science now makes available must be accompanied by unprecedented spiritual qualities that embrace and emphasize the principles of love, character, and a relational scientific-religious dialogue. The morality embedded in religion is needed to guide decisions about using the knowledge that science provides. As such occurs, we will realize that the central involvement of both science and religion is critical in dealing with the grinding problems that have pushed our world to a perilous brink.

Perhaps what we need is an admission of how little we know about how to pass safely through the next few decades and the courage to examine a wide range of alternatives. As we approach the 21st century, an ethical transformation and the invitation to continued dialogue and collaboration marks a unique moment and opportunity in the relationship of religion and science.

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